# A PLUMB PNEUMATIC JIG EXPERIMENT

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# R E P O R T

O N

A Plumb Pneumatic Jig Experiment

performed by

L,F,Paddison

Presented as A Thesis

for

PROFESSIONAL DEGREE

in

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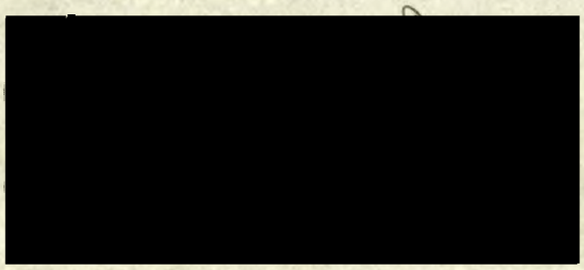

# PLUMB JIG EXPERIMENT.

PURPOSE:

The purpose of this Experiment is to determine to what extent the Plumb Pneumatic Jig would eliminate the quartz content and increase the zinc content in Zinc Concentrate Pile No.8.

Zinc Concentrate Pile No.8 is a hutch product from the Hartz Jig in the Zinc Plant. This product is the undersize from a ¾" trommel.

OPERATIONS:

Head Sample -

I obtained about 140 pounds of sample from Pile No.8 by taking 10 shovels of concentrate at equal intervals around the pile and half way up its sides. Before doing this I removed 6 inches of surface which enabled me to obtain a more nearly representative sample.

This sample was put through the coffee grinder and reduced to pass 6 mesh. A screen test was made upon half of this sample, 1123 ozs, and a head sample cut for assay.

## HEAD SAMPLE ASSAY.

| | Au. | Ag. | Cu. | Insol. | Fe. | Zn. |
|---|---|---|---|---|---|---|
| Head Sample..... | 0.12 | 7.44 | 3.75 | 13.6 | 15.4 | 31.9 |

## SCREEN TEST.

| Sizes. | Ozs. Wgt. | % of Total | Au. | Ag. | Cu. | Insol. | Fe. | Zn. |
|---|---|---|---|---|---|---|---|---|
| - 4 + 10 | 16.0 | 1.43 | 0.08 | 6.47 | 3.6 | 14.4 | 19.5 | 28.6 |
| -10 + 20 | 209.5 | 18.66 | 0.11 | 6.94 | 3.2 | 11.2 | 17.0 | 31.0 |
| -20 + 30 | 151.5 | 13.49 | 0.09 | 7.31 | 3.4 | 13.0 | 15.6 | 32.2 |
| -30 + 40 | 113.0 | 10.06 | 0.10 | 7.40 | 3.4 | 12.6 | 15.4 | 33.2 |
| -40 + 60 | 165.0 | 14.70 | 0.13 | 7.27 | 3.4 | 12.8 | 14.0 | 33.5 |
| -60 + 80 | 22.5 | 2.00 | 0.11 | 7.49 | 3.4 | 18.0 | 14.4 | 34.1 |
| -80 + 100 | 77.0 | 6.86 | 0.12 | 7.33 | 3.4 | 16.2 | 14.6 | 33.8 |
| -100+ 150 | 47.0 | 4.19 | 0.16 | 7.49 | 3.6 | 16.4 | 15.4 | 32.4 |
| -150 | 321.5 | 28.61 | 0.12 | 6.92 | 4.5 | 17.4 | 15.4 | 31.2 |
| Total.. | 1123. | 100.00 | | | | | | |

NOTE: In checking the amount of Insol. Fe. and Zn. in Head sample against amounts found on different screens, in screen test, there is a 5.4% gain in insoluble; .59% gain in zinc and the iron checks. This error may be due to assaying or to sampling. The following results obtained did not warrant re-checking the entire work for the purpose of correcting this error.

Screen sizing was done more closely than Mr. Plumb recommends, because of the very limited field for separation. There were relatively few free particles of quartz present, the balance of the quartz content being attached to small particles of sphalerite, calcopyrite or pyrite. The free quartz particles were the only particles subject to separation, but of course many particles were composed of quartz and sphalerite, and some tended to contain more quartz than sphalerite; these should, have found ~~find~~ their way into the tails, but did not necessarily do so. A table of the Specific Gravity of various particles, composed of varying amounts of quartz and zinc, attached to this report, will tend to explain the limited field for separation, which is due to the closeness of the specific gravity of the particles and also to the fact that they grade from the lowest to the highest, without marked difference.

## PRODUCTS TREATED.

Mixed Feed. All attempts with mixed feed to produce - 1st, a bed; and 2nd, to make a separation without a bed, proved a failure. Every possible variation between pulsations, pressure, amount of air, feed and adjustment of tail gate, was tried. I did not, however, try to make a separation on an artificial bed.

## RESULTS OBTAINED OF SCREEN PRODUCTS.

Product -4 +10. I made every possible adjustment of varying conditions, on this product. All proved failures. Using the highest pressure of 50# and admission of all the air it would take, with smallest number of pulsations (450 per min.) gave the

only condition that so much as moved the bed. The action on the bed occurred in the center, the sides remaining quiet. This movement failed to give a discharge on either tail or concentrate side.

PRODUCT: - 10 + 20

| No. | Name | Bed | Per Min. Pulsation | Lbs Pressure | Turns Tail Gate | Turns Feed | Needle Valve | Min. Run | Ozs Wgt. | Assays Insol. | Fe. | Zn. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | -10+20 | Ore | 450 | 25 | Level | 7 | ½ | - | - | 11.2 | 16.0 | 33.6 | Concts. |
| 3 | | | | | | | | | | 12.2 | 16.6 | 31.0 | Tails |
| 4 | -10+20 | Ore | 580 | 30 | Level | 7 | ½ | 6 | 11½ | 11.0 | 17.4 | 31.9 | Concts. |
| 5 | | | | | | | | | 17 | 13.0 | 15.4 | 31.2 | Tails |
| 7 | -10+20 | Ore | 580 | 30 | 5 | 7 | ⅓ | 10 | 11¼ | 12.2 | 15.0 | 32.9 | Tails |
| 8 | | | | | | | | | 28 | 10.4 | 17.6 | 31.6 | Concts. |
| 9 | -10+20 | Ore | 580 | 35 | 5 | 6 | ½ | 8¼ | 33 | 10.8 | 20.8 | 32.7 | Concts. |
| 10 | | | | | | | | | 12 | 13.8 | 15.6 | 33.7 | Tails |
| 12 | -10+20 | Ore | 580 | 35 | 0 | 6 | ⅓ | 5⅔ | 28 | 13.0 | 16.2 | 32.2 | Tails |
| 13 | | | | | | | | | 20½ | 11.0 | 19.6 | 31.0 | Concts. |
| 14 | -10+20 | Ore | 760 | 20 | 0 | 7 | ⅓ | 12 | 9 | 11.6 | 17.6 | 31.0 | Concts. |
| 15 | | | | | | | | | 13½ | 12.6 | 17.0 | 31.2 | Tails |
| 16 | -10+20 | Ore | 760 | 25 | 0 | 7 | ⅓ | 10 | 14 | 10.4 | 17.8 | 31.5 | Concts. |
| 17 | | | | | | | | | 21½ | 12.4 | 16.6 | 31.4 | Tails Re-run |
| 18 | 17 Tails | Ore | 760 | 25 | 5 | 7 | ½ | - | 20½ | 10.8 | 17.0 | 31.3 | Concts. |
| 19 | | | | | | | | | 9 | 14.4 | 15.6 | 32.5 | Tails |
| 20 | -10+20 | Ore | 900 | 20 | 4½ | 7 | 1 | 8 | 17½ | 11.0 | 17.8 | 30.7 | Concts. |
| 21 | | | | | | | | | 8 | 13.6 | 15.8 | 32.2 | Tails |
| 22 | -10+20 | Ore | 900 | 20 | 0 | 7 | 1 | 5½ | 9 | 10.0 | 17.2 | 31.8 | Concts. |
| 23 | | | | | | | | | 14½ | 12.0 | 17.6 | 30.7 | Tails |
| | -10+20 | Lead | 900 | 40 | 4½ | 6 | 1 | 6⅔ | 17½ | | | | Bed 5 oz. Granul[d] |
| | | | | | | | | | 20 | | | | Did not sample. Re-run tail |
| 25 | -10+20 | Lead | 900 | 40 | 4½ | 6 | 1 | | 26½ | 10.4 | 21.6 | 31.1 | Concts. |
| 26 | | | | | | | | | 11 | 13.8 | 20.8 | 31.7 | Tails |
| 27 | -10+20 | Lead | 450 | 45 | 0 | 6 | ⅓ | 10⅓ | 5½ | 11.0 | 18.2 | 31.3 | Concts. |
| 28 | | | | | | | | | 27 | 12.0 | 16.4 | 32.6 | Tails |

It will be observed from the above figures that there is a general rule regarding the concentration, that is, the separation seems to be between the quartz and sphalerite as a tail; and the calcopyrite, pyrite and sphalerite composing the concentrate.

Samples 16 and 17, retreating tails 17, show the largest variation in quartz, between concentrates and tails. The composite tails shows insoluble 14.6%; composite concentrate 10.6%; while the sphalerite increase in the tail is very scarce in the majority of results tabulated. It does, however, show a slight separation. Samples 2 and 3 show the largest separation of sphalerite in this sized product, an increase of 2.6% over the feed. In this case the increase in zinc contents, is in the concentrate, just reverse of the ordinary condition. The insoluble content is decreased only 1%.

Samples numbered 25 and 26 were made on an artificial granulated lead bed. This bed did not improve conditions or better the concentrate. Every possible adjustment was tried upon this feed. The results recorded appeared to be the very best conditions.

PRODUCT -20 +30

| No. | Name | Bed | Per Min. Pulsation | Lbs. Pressure | Turns Tail Gate | Turns Feed | Turns Needle Valve | Min. Run | Ozs. Wgt. | Assays Insol. | Assays Fe. | Assays Zn. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73 | -20+30 | Ore | 450 | 15 | 2 | 6 | 1/3 | 10 | 9 | 12.4 | 16.2 | 33.0 | Concts |
| 74 | | | | | | | | | 4¾ | 16.4 | 13.2 | 34.2 | Tails |
| 75 | -20+30 | Ore | 580 | 20 | 2 | 6 | 3/10 | 10 | 7½ | 12.0 | 15.6 | 32.5 | Concts. |
| 76 | | | | | | | | | 4 | 15.6 | 13.8 | 34.0 | Tails |
| 77 | -20-30 | Ore | 580 | 25 | 2½ | 6 | 3/10 | 16 | 18½ | 12.4 | 15.6 | 33.0 | Concts. |
| 78 | | | | | | | | | 13¾ | 14.4 | 14.4 | 32.7 | Tails Re-run |
| 79 | 78-Tails | Ore | 580 | 25 | 2½ | 6 | 3/10 | 10 | 7 | 18.6 | 15.4 | 33.2 | Concts. |
| 80 | | | | | | | | | 5 | 21.8 | 13.8 | 32.8 | Tails |
| 81 | -20+30 | Ore | 760 | 15 | 2 | 6 | 1/3 | 10 | 9 | 17.8 | 15.8 | 32.7 | Concts. |
| 82 | | | | | | | | | 5¼ | 19.4 | 15.2 | 32.4 | Tails |
| 83 | -20+30 | Ore | 760 | 30 | 2½ | 5 | 3/10 | 10 | 13½ | 17.8 | 15.6 | 33.1 | Concts. |
| 84 | | | | | | | | | 6½ | 20.2 | 14.8 | 32.9 | Tails |
| 85 | -20+30 | Ore | 900 | 10 | 3 | 5 | 1 | 5 | 8½ | 17.4 | 16.0 | 32.4 | Concts |
| 86 | | | | | | | | | 3 | 20.8 | 13.6 | 33.2 | Tails |
| 87 | -20+30 | Ore | 900 | 20 | 2½ | 5 | 1/3 | 5 | 9¼ | 16.6 | 16.6 | 32.3 | Concts. |
| 88 | | | | | | | | | 3½ | 20.8 | 13.2 | 33.9 | Tails |
| 89 | -20+30 | Ore | 900 | 30 | 2½ | 5 | ¼ | 5 | 5½ | 14.8 | 16.0 | 32.1 | Concts. |
| 90 | | | | | | | | | 2¼ | 19.4 | 13.4 | 33.3 | Tails |

This product was no more amenable to separation than product -10+20. Here it appears not unlike the former product in that, the tails show an increase in insoluble while the zinc does not appear to do anything desired of it, either to enrich the concentrate or the tails.

Every possible adjustment was tried, and only the best conditions sampled.

PRODUCT -30 +40

| No. | Name | Bed | Per Min Puls-ation | Lbs. Pres-sure | Turns Tail Gate | Turns Feed | Turns Needle Valve | Min. Run | Ozs. Wgt. | Assays Insol. | Fe. | Zn. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | -30+40 | Ore | 450 | 15 | 0 | 5 | 1/5 | 10 | 3 | 13.0 | 14.2 | 34.7 | Concts. |
| 31 | | | | | | | | | 4½ | 13.4 | 14.2 | 33.9 | Tails |
| 32 | -30+40 | Ore | 450 | 20 | 0 | 7 | 1/5 | 10 | 4 | 12.2 | 15.8 | 34.0 | Concts. |
| 33 | | | | | | | | | 5¼ | 13.2 | 13.4 | 34.3 | Tails |
| 34 | -30+40 | Ore | 580 | 15 | 2 | 7 | 1/5 | 29 | 12 | 13.2 | 14.2 | 34.1 | Concts. |
| | | | | | | | | | 14¾ | | | | Tails Re-run |
| 35 | Tails-34 | Ore | 580 | 15 | 2 | 7 | 1/5 | - | - | 13.0 | 14.8 | 35.0 | Compos.Concts |
| 36 | | | | | | | | | - | 14.2 | 13.8 | 34.6 | Tails |
| | -30+40 | Ore | 760 | 15 | 2 | 7 | ¼ | 24½ | 9¼ | | | | |
| | | | | | | | | | 12 | | | | Tails.Re-run 37&38. |
| 37 | Tails | Ore | 760 | 15 | 2 | 7 | ¼ | - | 14½ | 13.5 | 15.0 | 34.2 | Compos. Concts |
| 38 | | | | | | | | | 6¾ | 13.7 | 14.8 | 34.3 | Tails |
| 39 | -30+40 | Ore | 900 | 15 | ½ | 7 | ¼ | 10 | 3¾ | 14.0 | 14.8 | 33.4 | Concts. |
| 40 | | | | | | | | | 6 | 14.0 | 14.4 | 34.0 | Tails |
| 41 | -30+40 | Lead | 900 | 15 | 0 | 7 | ¼ | 9⅔ | 4¾ | 13.9 | 14.4 | 34.2 | Concts.Bed 30 +40-80 |
| 42 | | | | | | | | | 4½ | 15.4 | 13.2 | 34.6 | Tails.Granulated Lead |

I re-treated a greater number of tail products on -30+40 than was tried on previous screen tests. Artificial beds of granulated lead were also used on this product. The results were very unsatisfactory. All the different adjustments were tried, the above being the only ones suitable for sampling.

## PRODUCT -40 +60

| No. | Name | Bed | Per Min. Puls-ation | Lbs. Pres-sure | Turns Tail Gate | Turns Feed | Turns Needle Valve | Min. Run | Ozs. Wgt. | Assays Insol. | Fe. | Zn. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59 | -40+60 | Ore | 450 | 3 | 1½ | 5 | ¼ | 15 | 10¾ | 14.2 | 14.6 | 33.8 | Concts. |
| 60 | | | | | | | | | 4 | 17.8 | 13.6 | 35.1 | Tails |
| 61 | -40+60 | Ore | 450 | 10 | 1 | 5 | ⅕ | 30 | 19½ | 13.4 | 14.4 | 33.2 | Concts. |
| 62 | | | | | | | | | 10 | 16.0 | 13.2 | 33.7 | Tails. Re-run |
| 63 | Tails 62 | Ore | 450 | 10 | 1 | 5 | ⅕ | 13½ | 6¼ | 15.0 | 14.2 | 34.3 | Concts. Not Composite |
| 64 | | | | | | | | | 2¾ | 16.8 | 12.4 | 34.8 | Tails |
| 65 | -40+60 | Ore | 450 | 15 | 1 | 6 | 3/20 | 10 | 4 | 15.0 | 14.0 | 34.2 | Concts. |
| 66 | | | | | | | | | 2 | 17.6 | 12.4 | 34.1 | Tails |
| 67 | -40+60 | Ore | 580 | 5 | 1½ | 6 | ⅕ | 10 | 5 | 15.0 | 14.0 | 34.6 | Concts. |
| 68 | | | | | | | | | 1¾ | 18.2 | 13.0 | 34.0 | Tails |
| 69 | -40+60 | Ore | 580 | 10 | 1½ | 6 | ⅕ | 10 | 5½ | 13.4 | 14.8 | 33.0 | Concts. |
| 70 | | | | | | | | | 2 | 18.6 | 12.0 | 33.5 | Tails |
| 71 | -40+60 | Ore | 760 | 4 | 1½ | 6 | ¼ | 10 | 8¼ | 12.8 | 15.0 | 33.2 | Concts. |
| 72 | | | | | | | | | 3 | 15.4 | 13.2 | 34.3 | Tails |

Product -40+60 seems to be more adapted to treatment than any product tried. In samples 69 and 70 concentrates and tails respectively, there is a difference of 5.2% insoluble, 2.8% iron and .5% zinc. The separation is between the quartz and pyrite. The sphalerite is equally distributed. The variation in Specific Gravity between quartz and pyrite is 2.66 to 5. Of course the close grading of products from one to the other makes an unsatisfactory separation, with so small amount of free quartz present.

## PRODUCT -60 +80

| No. | Name | Bed | Per Min. Puls-ation | Lbs. Pres-sure | Turns Tail Gate | Turns Feed | Turns Needle Valve | Min. Run | Ozs. Wgt. | Assays Insol. | Fe. | Zn. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | -60+80 | Ore | 450 | 10 | 0 | 6 | ⅕ | 16 | 1 | 14.8 | 14.6 | 33.9 | Concts. |
| 44 | | | | | | | | | 2½ | 16.3 | 13.8 | 32.6 | Tails |
| 45 | -60+80 | Ore | 580 | 10 | ½ | 6 | ⅕ | 10 | 1¾ | 15.0 | 14.2 | 33.1 | Concts. |
| 46 | | | | | | | | | 1¾ | 15.8 | 13.4 | 33.9 | Tails |
| 47 | -60+80 | Ore | 450 | 5 | 0 | 6 | ¼ | 10 | 1½ | 15.0 | 14.2 | 34.0 | Concts. |
| 48 | | | | | | | | | 1¾ | 15.2 | 13.8 | 34.5 | Tails |

## PRODUCT -80 +100

| No. | Name | Bed | Per Min. Pulsation | Lbs Pressure | Turns Tail Gate | Turns Feed | Turns Needle Valve | Min. Run | Ozs. Wgt. | Assays Insol. | Fe. | Zn. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | -80+100 | Ore | 450 | 2 | 0 | 6 | 1/3 | 10 | 7½ | 15.0 | 14.6 | 33.4 | Concts. |
| 50 | | | | | | | | | 2½ | 16.2 | 14.0 | 33.8 | Tails |
| 51 | -80+100 | Ore | 450 | 5 | 0 | 6 | ¼ | 20 | 14 | 15.6 | 14.6 | 33.2 | Concts. |
| 52 | | | | | | | | | 6¼ | 16.0 | 14.0 | 33.7 | Tails |
| 53 | -80+100 | Ore | 450 | 15 | 0 | 6 | 1/5 | 20 | 13½ | 15.4 | 14.2 | 33.8 | Concts. |
| 54 | | | | | | | | | 5½ | 15.8 | 14.0 | 34.1 | Tails |
| 55 | -80+100 | Ore | 580 | 5 | 0 | 4 | 3/10 | 43 | 26 | 14.8 | 15.0 | 33.6 | Concts. |
| 56 | | | | | | | | | 10 | 15.8 | 14.0 | 33.6 | Tails. Re-run |
| 57 | Tails 56 | Ore | 580 | 5 | 0 | 4 | 3/10 | 6 | 30¾ | 15.2 | 14.6 | 33.3 | Concts. Compos- |
| 58 | | | | | | | | | 2¼ | 15.6 | 14.2 | 34.0 | Tails ite |

These products show very unsatisfactory results. The variation of adjustments of Jig is much more limited, with finer products than coarse. High pressures blew the bed out, and the increased pulsations did not allow the products in the bed to settle and separate or segregate, but seemed to hold them suspended in the air.

## PRODUCTS: -100 +150 and -150.

Not a single set of adjustments would handle products -100 +150 or -150. Under all conditions blow holes would form and concentration was impossible.

All samples for assay were cut by a Jones sampler after a thorough rolling. These were ground to pass a 100 mesh and were well mixed before assaying.

## SPECIFIC GRAVITY TESTS.

To determine the field allowed for separation, I made the following specific gravity test:

| | | Sp.Gr. |
|---|---|---|
| No.1 | Blende showing some quartz attached to its surface in thin slabs..... | 3.83 |
| No.2 | Similar to No.1 with apparently less quartz..... | 3.83 |
| Nos. 3, 4 and 5 | appeared to have less quartz than No.2 | 3.87 |
| No.4 | . . . . . | 3.99 |
| No.5 | . . . . . | 3.93 |
| No.6 | This was an exceptionally clean looking piece of sphalerite..... | 4.09 |
| No.7 | Sphalerite showing more quartz than 1,2,3,4, and 5, and also more closely associated with sphalerite. This sample showed very small amount of calcopyrite and pyrite..... | 3.76 |
| No.8 | Similar to No.7, showing an increase in calcopyrite and pyrite..... | 3.96 |
| Nos. 9 and 10. | These samples were exceptionally clean pieces of calcopyrite, with very little pyrite and no sphalerite or quartz..... | 4.73 |
| NO.10 | . . . . . | 4.79 |
| No.11 | This sample contained much quartz and considerable calcopyrite. No sphalerite was visible | 3.89 |
| No.12 | Piece of alaskite porphryr showing small crystals of pyrite scattered..... | 2.94 |
| Nos.13 and 14. | These two samples consisted of the best looking piece of calcopyrite I could find in the Mammoth Ore Bins..... | 4.66 |
| No.14 | . . . . . | 4.69 |
| Nos.15 and 16. | Exceptionally clean looking pieces of sphalerite from Pile No.8..... | 4.05 |
| No.16 | . . . . . | 4.10 |

ANALYSES MADE OF THESE SAMPLES WERE AS FOLLOWS:

| | | Cu. | Insol. | Fe. | Zn. |
|---|---|---|---|---|---|
| No.A | Composite made up of samples 1,2,3,4,5 | 0.4 | 11.6 | 2.3 | 51.0 |
| No.B | Sample No.6 ..... | 0.2 | 2.0 | 1.0 | 60.8 |
| No.C | Composite made up of samples 9 & 10 | 5.4 | 1.6 | 42.6 | 2.0 |
| No.D | Composite made up of samples 13 & 14 | 7.6 | 3.2 | 40.8 | None |
| No.E | Composite made up of samples 15 & 16 | 0.55 | 2.0 | 3.4 | 59.8 |

It will be observed from the above tables, that Composite A is composed more nearly of representative material of Pile 8 and shows a 11.6% insoluble content and also a corresponding high zinc content of 51.%.

Composite B and E represent very clean and pure pieces of sphalerite, chosen with extreme care; the analyses show a relative low quartz content, only 2% insoluble, and an extremely high zinc content of 60%.

Composite C and D show two grades of exceptionally clean calcopyrite. Composite C is taken from Pile No.8; while Composite E was picked from Mammoth Ore Bins. Considerable of this material occurred in the Zinc concentrate Pile No.8. The presence of this calcopyrite and its small difference in specific gravity from the sphalerite, 0.9, is due to the failure of making a separation between these products.

The specific gravity of quartz is 2.66, while the specific gravity of the average piece of sphalerite is about 3.7. The small variation between these figures shows the limited possibility for separation between the two, when they grade into each other as they do. Consequently this limited field, as well as the opportunity for two separations, called for very fine and careful adjustment during the operation of this experiment.

## SUMMARY.

APPEARANCE:

During the entire experiment there was not one run in which I was able to observe, with the eye or a glass, any difference between the concentrate and tails products.

It was impossible to know when the jig was doing its best work or to make profitable adjustments, other than could be

observed, because the test was completed before assays were determined.

BEDS:

Artificial beds of calcopyrite and granulated lead were used. These in all cases proved of no advantage, and did not render as good results as a bed of original feed. Results on calcopyrite beds were not recorded because both concentrates and tails contained noticeable amounts of calcopyrite and made the sample worthless.

I attempted to produce a bed from feed, by allowing the jig to work on the feed for about 4 hours. The bed produced at the end of this period did not differ from the original feed. Consequently my first serious obstacle resulted when starting the experiment, as a bed is essential to the success of this jig.

LIMITS OF TREATMENT:

Only 65.77% of the original sample was applicable to this treatment. Of the 65.77%, 8.87% required extremely careful adjustment of jig to enable its being treated.

CAPACITY:

The capacity on this feed is very low. The average capacity of all runs made in this test is as follows:-

Average capacity equals .3651 ozs per minute per sq.inch working screen.

This would enable the treating of 1.774 tons per 24 hours on a large size jig (3" x 36").

Minimum capacity is equal to .0406 ozs per minute per sq.inch working surface, or .1955 tons per 24 hours on a large machine (3" x 36").

Maximum capacity is equal to 1.59 ozs per minute per sq.inch working surface, or 7.737 tons per 24 hours on a large machine (3" x 36").

The working surface of the screen of the experimental Plumb Jig is $1\frac{7}{8}$" x $2\frac{7}{8}$".

## CONSLUSIONS.

The Experiment proved very unsatisfactory when referring to the purpose desired, because

First: Failed to produce working bed.

Second: Failed to make a product materially higher in Zinc than its feed.

Third: Failed to separate quartz and sphalerite.

Experiment made
Jan.20 to Feb.17,1916.
Kennett, California.

Respectfully submitted,

L. F. Paddison.